UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,145	12/28/2001	Jung Il Kim	0465-0882P-SP	5232

2292 7590 02/15/2005

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747

EXAMINER	
QI, ZHI QIANG	
ART UNIT	**PAPER NUMBER**
2871	

DATE MAILED: 02/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/029,145	KIM ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12,14-24 and 26-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,14-24 and 26-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The previous final rejection mailed on Aug.20, 2004 has been withdrawn and the prosecution has been reopened.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 8,17 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,337,520 (Jeong et al) in view of US 6,433,842 (Kaneko et al) and US 6,310,674 (Suzuki et al).

Claims 1, 8, 17 and 26-28, Jeong discloses (col.6, line 56 – col. 8, line 49; Figs.9 -11) a TFT substrate structure used in a LCD device comprising:

(concerning claims 1 and 26):

- substrate (100);
- TFT having gate electrode (210) and source (610)/drain (620) electrodes on the substrate (100);
- passivation film (700) formed on an entire surface of the substrate (100) and having contact hole (710) in the drain electrode (620) of the TFT;

- pixel electrode (800) connected to the drain electrode (620) thought the contact hole (710), and the drain electrode (620) having a single-layer structure;
- pixel electrode (800) formed of ITO layer with thickness of 300 -2000 Å, that would be a sufficient thickness according to the dependent claim 6 in which the pixel electrode has a thickness of approximately 500 – 2000 Å.

(concerning claims 8 and 27):

- substrate (100);
- gate electrode (210) and gate pad (220) formed of Al or Al alloy (metal film) on the substrate (100), and the gate line (200) also formed of Al or Al alloy (same material);
- pixel electrode (800) formed on the metal film, such as formed on the gate electrode (210) or gate pad (220) (metal film);
- pixel electrode (800) formed of ITO layer with thickness of 300 -2000 Å, that would be a sufficient thickness according to the dependent claim 6 in which the pixel electrode has a thickness of approximately 500 – 2000 Å.

(concerning claims 17 and 28):

- forming gate line (200) including a gate electrode (210) and gate pad (220) on substrate (100);
- forming gate insulating film (300) on the entire surface of the substrate (100);
- forming amorphous silicon layer (semiconductor film) (400) above the gate electrode (210);

- forming data line (600) including a data pad (630) to form source and drain electrodes (610,620) of TFT at both sides above the semiconductor film (400);
- forming passivation film (700) on the entire surface of the substrate (100);
- forming contact holes (such as 710, 720,730) in the drain electrode (620), the gate pad (220) and the data pad (630) of the TFT;
- forming transparent conductive film such as ITO film, in each pixel region, such as pixel electrode (800) connected to the drain electrode (7), gate ITO layer (810) connected to the gate pad (220) and data ITO layer (820) connected to the data pad (630) through contact holes (710,720,730);
- pixel electrode (800) formed of ITO layer with thickness of 300 -2000 Å, that would be a sufficient thickness according to the dependent claim 6 in which the pixel electrode has a thickness of approximately 500 – 2000 Å;
- drain electrode (620) having a single-layer structure, and the data pattern also can have single layered structure (col.8, lines 29-30).

Jeong does not disclose the pixel electrode made of an amorphous transparent conductive film or a polycrystalline transparent conductive film for preventing a generation of a galvanic effect.

However, Kaneko discloses (col.5, lines 47-51) that amorphous indium tin oxide (a-ITO) or indium zinc oxide (IZO) (amorphous transparent conductive film) allows for use of a weak-acid etchant is preferably used as the material of the pixel electrodes so that the aluminum alloy (such as the drain electrode under the pixel electrode made of

metal) is prevented from being damaged during etching of the pixel electrodes. Even though Kaneko discloses that the amorphous ITO is used in case of a layered structure for the drain lines, but Kaneko discloses the function of the amorphous ITO and the property of the amorphous ITO.

Kaneko indicates (col.5, lines 59-61) that alternately, the drain lines are composed of a single layer. That means in case of using single layer structure for the drain electrode, the material of amorphous ITO also can be used for the pixel electrode.

Kaneko indicates (col.5, lines 61-65) that this constitution having no aluminum alloy eliminates the necessity of considering possible damage on the interconnection during etching of the pixel electrodes, allowing for use of polycrystalline indium tin oxide (poly-ITO) having high reliability as the pixel electrodes. Therefore, using polycrystalline transparent conductive film to form pixel electrode would have high reliability.

Although Kaneko does not explicitly discloses the function of preventing the generation of a galvanic effect by a stripper, but Kaneko indicated (col.5, lines 47-51) that using amorphous indium tin oxide (amorphous transparent conductive film) as the material of the pixel electrode to prevent the damage during etching of the pixel electrode.

Concerning the motivation of using amorphous transparent conductive film as the material of the pixel electrode, Suzuki discloses (col.4, lines 43 – 65) that the transparent film (transparent conductive film such as ITO) containing an amorphous component (amorphous transparent conductive film) is excellent in surface flatness and sufficiently contributing to an improvement in characteristics of a display device as a

display electrode, and such amorphous transparent film allows a variety of etchants inclusive of weak acids in an etching step during a pattern formation so as to enhance performances of a resultant display device provided with the transparent film as a display electrode. The galvanic effect means that the electrode generates galvanic corrosion during etching step. Therefore, using the same material such as the amorphous transparent conductive film or polycrystalline transparent conductive film with a sufficient thickness (such as 300 -2000 Å) would have the same property and same technical results to achieve an enhanced performances and a high reliability as a pixel display electrode.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a pixel electrode made of an amorphous transparent conductive film or polycrystalline transparent conductive film as claimed in claims 1, 8, 17 and 26-28 for achieving an enhanced performances and a high reliability as a pixel display electrode.

3. Claims 2-7, 9-12, 14-16,18-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeong, Kaneko and Suzuki as applied to claims 1, 8, 17 and 26-28 above, and further in view of US 5,135,581 (Tran et al).

Claims 2-5, 9-12,18-22, lacking limitation is such that the ITO or IZO added H_2 or H_2O and forms at a predetermined temperature.

However, Tran discloses (col.2, line 20 – col.3, line 5) that a process for forming a light transmissive electrically conductive composition at a temperature from 20°C to 300°C and sputtering occurs in a gaseous mixture comprising a sputtering gas and a

stabilizing gas such as H_2 or H_2O. The pixel electrode made from amorphous ITO or IZO also is a light transmissive conductive composition. Tran indicates (col.2, line 20 – col.3, line 5) that such forming process at the temperature from 20°C to 300°C and containing such stabilizing gas H_2 or H_2O advantageously reduces the visible light absorption and renders more stable. Based on the prior art of reference Tran disclosed the temperature range, the skilled in the art would perform a suitable temperature range such as 150°C to 350°C, and that would have been at least obvious (see MPEP 2144.05, "overlap ranges disclosed by the prior art" a prima facie case of obviousness exists).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use amorphous ITO or amorphous IZO forming the pixel electrode at a predetermined temperature and adding H_2 or H_2O as claimed in claims 2-5, 9-12 and 18-22 for reducing the visible light absorption and achieving more stable characteristics.

Claims 6-7, 15-16 and 23-24, Jeong discloses (col.12, lines 11-17) that pixel electrode (800) formed of ITO layer with thickness of 300 -2000 Å, and the thickness range overlaps the thickness range 500-2000 Å as claimed (see MPEP 2144.05, "overlap ranges disclosed by the prior art" a prima facie case of obviousness exists).

Claim 14, Jeong discloses (Fig.10) that the metal film such as the drain electrode (620) having a single-layer structure.

Response to Arguments

4. Applicant's arguments with respect to claims1-12,14-24 and 26-28 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1) US 5,811,836 (Ha) discloses (col.2, lines 5-10) that the pixel electrode is easily damaged during the etching process of the metal, and this damage is caused by a galvanic effect during wet etching. Therefore, the material amorphous ITO or IZO or poly-ITO is used for preventing the damage during etching of the pixel electrode caused by a galvanic effect.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Qi
January 27, 2005

KENNETH PARKER
PRIMARY EXAMINER